

# Mount Diablo Astronomical Society

## *Diablo Moon Watch*

August 2012

### **GENERAL MEETING**

**Tuesday August 28, 2012**

**Close-in Planets: From Hot Jupiters to Super Mercuries**

*By Dr. Eugene Chiang*

*Doors open at 6:45 p.m.  
Concord Police Association Facility  
5060 Avila Road, Concord*



***The closest-in planets, with periods as short as 10 hours, are now a well-established population, thanks to Doppler and transit surveys.***

These bodies present a number of challenges: how did they form and achieve their tight orbits, and how do they evolve and survive in the face of intense irradiation from their parent stars? This month, Dr Chiang reviews their possible origins, including in situ accretion; disk-driven migration; and eccentricity excitation and tidal capture and will conclude by describing how close-in planets lose mass via thermal winds driven by stellar heating, such as the curious case of Kepler Input Catalog 12557548 – which may represent the first example of a geologically active mercury-sized planet in its final death throes.

Dr. Eugene Chiang received his Bachelor's degree in Physics from MIT, and his PhD in Astronomy from Caltech. After a brief postdoctoral stint at the Institute for Advanced Study in Princeton, NJ, Eugene took up a faculty position in Astronomy at Berkeley, where he has been ever since, now serving as the Director for Integrative Planetary Science.

His research focuses on planet formation and evolution. Of the more than ten courses he has taught at Berkeley, his favorite is order-of-magnitude physics, where students are taught how to estimate any quantity under the Sun to within a factor of 10.

## **Scientific Illiteracy: Reasons Why**

*by Nathaniel Bates*

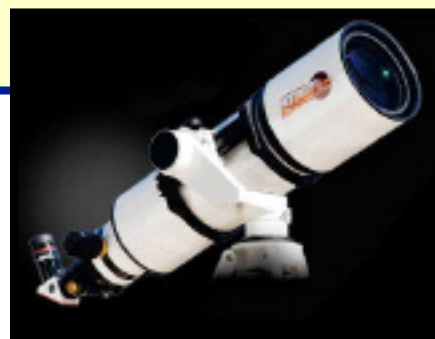
I literally leaped out of my chair. I could not believe the figure being presented to me.

***One out of five Americans believes that the Sun goes around the Earth.***

There has to be a mistake! I mean, given that Astronomers like Carl Sagan, Neil Tyson, and the irascible "Bill Nye the Science Guy" are celebrities, and given that clubs like ours do regular outreach, and most importantly, given that we live in the Twenty-First century, all people ought to know that the

*(Continued on page 5 )*

### **WHAT'S UP**



**My solar Adventures with my Lunt 100 solar scope.**

*By Nick Tsakoyias*

## PRESIDENT'S CORNER

## Extremely High Speed DSLR Astrophotography

by Chris Ford

*At the Golden State Star Party (GSSP) in July I tested a new Canon 60Da DSLR camera customized for astronomical usage with my new 24" F/3.25 Spica Eyes telescope with a Lockwood mirror and Paracorr 2 coma corrector.*

The results were a startling demonstration of what can be achieved through an optical system with a large aperture and fast photographic speed. The images you see in this Presidents corner that are of almost magazine cover quality, were all exposed in just 15 seconds with no stacking or any post processing whatsoever and what you see is literally raw straight out of the camera. Typically high quality deep sky images have required hours of multiple exposures stacked together with significant processing in Photoshop to reduce noise and bring out the detail, so it is remarkable that what would have once taken hours to acquire and process can be done in 15 seconds under the right conditions. Certainly being under a dark sky was a major factor, but the low noise characteristics of the current generation of DSLR cameras combined with fast focal ratio optics, are increasingly able to produce high quality astronomical images out of the box.

To create these images, I simply attached the camera through an adapter to the Paracor 2 coma corrector mounted in the eye-piece holder of my telescope, (which is necessary to correct the coma in the very fast F/3.25 optics) and aiming at a bright star used the live view display on the back of the camera at 10X to come to focus simply by eye. I then aimed the telescope at M27 as my first test, though it is too dim to be seen in the live video image on the camera back. What I could easily see live however, were the surrounding bright stars, so framing the target through live view was relatively easy.

A few second test exposures with my shutter timer helped center M27 more precisely, after which I shot a 15 second exposure and moved right onto the next target M17. That was all there was to it. Looking at the results pop up instantly in full color in live view in the dark after just 15 seconds was awesome - instant gratification! Using the telescopes goto capabilities I could probably have imaged 100 objects before sunrise. In fact, perhaps the entire messier Marathon could be photographed in high fidelity in one night.

I also experimented with test exposure times of 10, 15, 20, all the way out to 60 seconds varying them against increasing and decreasing the ISO number. I was particularly interested in seeing how good my telescopes tracking was and when field rotation would set in as the telescope is

not equatorially mounted. (Dependent in turn on what part of the sky was being pointed at) In fact I was not expecting to get good results at an ISO as high as the 5000 I eventually used, and that it worked through the low noise characteristics of the Canon 60Da camera is I think impressive. 15 seconds, I found was the real sweet spot for ISO number and exposure time.

*For any alt/azimuth mounted telescope field rotation is always going to be a limiting factor unless the telescope is equatorially mounted or the field de-rotated either mechanically at the telescope or in software, which in turn requires that the images be exposed as fast as possible.*

Also though my 24" F/3.25 is certainly a stiff structure, whether it is stiff enough for 5 to 10 minute guided exposure without the telescope flexing is yet to be determined. Certainly I could have stacked multiple images to reduce residual noise even further to refine these images but that was not really the point. The experience of returning high quality color images in seconds was very similar to using video astronomy devices such as a Mallincam, but in this case at far higher resolution. I have a Mallincam myself and have always enjoyed using it, but the abilities of current generation DSLR cameras raises the question of whether custom astronomical video cameras are ultimately a dead end. Current and



### Extremely High Speed DSLR Astrophotography (Continued from the previous page)

future commodity cameras such as the Canon 60Da DSLR with high definition image and video outputs combined with ever lower on-board noise signal processing are even now outperforming them.

***Though I used a large 24" telescope to capture these images, it is really the fast focal ratio of the optics that matters.***

If you have a faster telescope or a focal reducer to make your optics faster you may like to experiment yourself. Ultimately these results illustrate an ongoing trend where the economics of the consumer marketplace are creating camera and other technologies that are continuing to impact the field of amateur astronomy and make what would once have taken hours possible in seconds.



*M17 exposed in only 15 seconds straight out of the camera.*



*M27 exposed in 15 seconds.*



*My new 24" F/3.25 Alt/Azimuth Newtonian Spica Eyes built by Tom Osypowski*

### Extremely High Speed DSLR Astrophotography *(Continued from the previous page )*



*M20 the Trifid Nebula exposed at high resolution and in full color in, yes 15 seconds.*



*Even low surface brightness objects like M101 did not escape from a 15 seconds exposure.*



*Galaxies like M51 were just as easy. . .*



### Scientific Illiteracy: Reasons Why (Continued from the page 1)

Sun is the center of the Solar System. I was angry and flabbergasted to learn that people who had been through our education system could be allowed to think anything but what Galileo proved four centuries ago. I began to wonder how an advanced society like the United States, begun in the rational idealism of the Enlightenment, could have such a large population of people who do not accept the most elementary understanding of Astronomy.



Those of you who are reading this online can pursue global scientific illiteracy figures through this link: <http://www.nsf.gov/statistics/seind06/append/c7/at07-10.pdf>

I will share a few of them with you.

Only 71% of Americans knew that the Earth goes around the Sun. "Don't know" and "Sun goes around the Earth" together amount to 29% of the population.

73% of Americans claimed that all radioactivity is manmade.

Only 35% believe in the Big Bang. Wait, it gets better.

Only 78% said that the center of the Earth is very hot.

To say that we are in real trouble is an understatement.

A great deal is said about how Americans are behind the rest of the world. I think that we need to be fair and show some of the figures from other countries. For one thing, according to this survey,

only 17% of Chinese believe in the Big Bang. Only 40% of Russians know about Continental drift. And, while this particular survey does not show it, more Russians than Americans believe that the Sun goes

around the Earth and more Europeans than Americans believe that cavemen and dinosaurs lived together at the same time! Scientific illiteracy appears to be global.

***As an Astronomy Club, we have an obligation to teach correct science as much as we can.***

We are not superhuman, but we should at least have good explanations for why the Big Bang is the best scientific explanation for the Universe as we see it (including some knowledge of red shifting, General Relativity, and the background radiation). We are not expecting a nation of cosmologists or experts on relativity. But, we at least expect a nation of people who know that we are not living on the inside of the Earth and that the Navy is not regularly

battling dragons. The mission of this club is that much more necessary given the crisis of global scientific knowledge. But, in order to do our job effectively, we had better get to some root causes for what appears to be problem of not only astronomical illiteracy, but of general scientific illiteracy. I will attempt to speculate on what I think those root causes may be, and how we can effectively address them.

For one thing, let us discuss what the reasons are NOT. There is an attempt to explain scientific illiteracy based on what I call the "Carl Sagan" narrative.

***The Sagan narrative suggests that many if not most people live in a "demon haunted world" in which Creationism, New Age religions, UFO cults, and Astrology all crowd out modern science.***

According to this line of thought, the reason scientific education is failing has to do with the influence of pre-modern thinking. Personally, I would be skeptical of this narrative on a number of fronts. My first bit of skepticism would be the fact that Science classrooms are not staffed with Creationists or New Age cultists waiting to be rescued from imminent collapse in 2012 by Annunaki from the Twelfth Planet. Few chemistry teachers are attempting to turn lead in to gold. Most Astronomy and Physics teachers do not subscribe to the belief that aliens advise Generals at the Pentagon on a regular basis. Even fewer biology teachers are

## Scientific Illiteracy: Reasons Why (Continued from the previous page)

attempting to fit Leprechauns on the evolutionary tree. Science teachers are the ones tasked with the responsibility of making sure that students know that the Earth goes around the Sun, and most are rational skeptics. I can blame Velikovsky and Sitchin for many things. I cannot blame them for what goes on (or does not go on) in the Science classroom.

Don't get me wrong. I believe that the influence of anti-scientific thinking is frightening. It concerns me that some religious groups have become more vocal over the past few decades in their views on evolution with some sects even attempting to end the separation of church and state so strongly encouraged by Thomas Jefferson. However, the global figures tell a more complex story than a simple question of religion and science.

Again, note the figures. China is an officially atheist country and yet only 17% believe in the Big Bang, fewer people than in America. Only 46% of Europeans knew that electrons were smaller than atoms as of 2005. Strangely, the last figure was a decided

increase from four years earlier, which might cast some aspersion on the accuracy of the test, or perhaps how questions are framed. Even considering those possibilities, however, the answers seem to suggest at least an unfamiliarity with science on the part of those beings asked. The variability of answers in Europe and America from one year to the next seems to suggest problem seems to be one of lack of knowledge and not some kind of ideological commitment to pre-modern thinking.

logical commitment to pre-modern thinking.

My sense is that there is a root cause for scientific illiteracy that few science teachers want to face.

***The problem may lie in how science is often taught.***

***Science is often thought of as a body of knowledge.***

Learn the knowledge—get the answer. It is a nice thought for those who simply want to learn and then to forget. It is not a nice thought for those who care about retention. Scientific knowledge needs to “stick.” People need to understand that science is a thought process, a method, and not simply a body of knowledge.

What frightens me is the possibility that some pupils might adamantly refuse to believe that the Earth goes around the Sun because they do not experience the movement of the Earth, while refusing to bring up the subject with their Science teachers for fear of ridicule or persecution. Science teachers need to be able to grapple with doubts that students might have about a certain scientific notion, and to actually provide the evidence that life evolves, or that the Earth moves around the Sun.

A student might ask, “If the Earth travels around the Sun, why don't we feel it?” It is much like driving in a car. After the initial acceleration, you are moving, but the car is moving with you. You are going at 65 mph, but you are stationary with respect to the car. You do not even feel the motion much unless you accelerate or shift slightly. The simple fact that it is possible to travel at incredible speeds with respect to the Sun and feel no movement can be demonstrated to a skeptical person by invoking their own experiences! Indeed, an actual engagement with the processes of scientific investigation would do a great deal to overcome resistance to Science. Allowing valid questions in the classroom

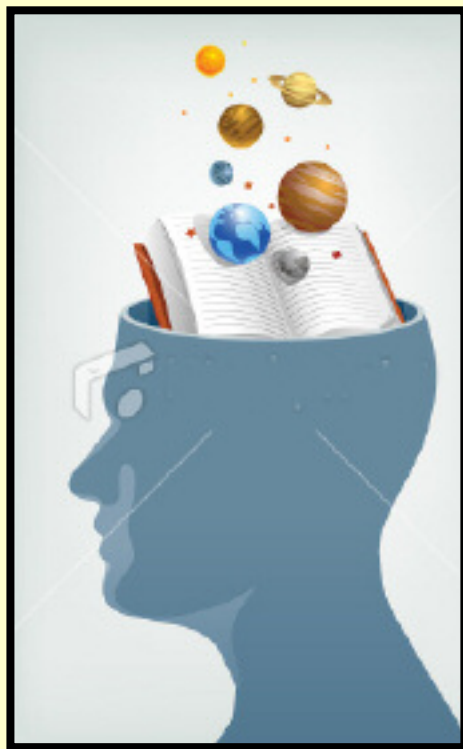
should not be an issue for Science teachers. That allows for engagement. What is a problem would be students simply learning for the sake of passing a test and moving on; forgetting what they have learned because learning was an alienated experience



### Scientific Illiteracy: Reasons Why (Continued from the previous page)

that whole time. This is the problem. Science teachers need to face and deal with if we as a society are going to stop the global epidemic of ignorance.

Clubs like ours can help. We can engage the public. Next time someone asks, "How long have you been an Astrologer?" you should avoid your usual cringe. Simply explain to the person the difference between Astronomy and



formity, and the usual reasons most of us with any sense hated growing up. Instead, we are

Astrology. If they insist on calling you an Astrologer, then by all means charge them a fee! The humor of that act will help them to remember the difference. Indeed, we have the unique capability to help matters by simple virtue of the fact that our events do not come with tests, passing, failure, ridicule, classroom con-

engaging the part of the mind that loves creativity, learning, and the excitement of the unknown. Nothing beats the thrill of first seeing M13 or the Andromeda. The skeptic who doubts that the Earth moves can safely come out of the closet and we can get in to the issue of frames of reference, momentum, and the usual responses. But, in order to draw them out, we cannot ridicule or blame them.

***The failure is a global one, and in a day and age in which scientific knowledge is key to addressing environmental concerns among the other challenges of a modern society, someone had better come up with a crazy solution because the sane ones seem to be failing.***

## Your Help Would Be Greatly Appreciated

Our association needs a few members to come at 6:30 p.m. before our monthly meeting which starts at 7:15 p.m. to help in setting up the chairs and other elements needed to conduct the general meeting.

Similarly at the end of each meeting the chairs and tables have to be removed, the room has to be cleaned and the garbage emptied.

***Thank you for your help.***



### Mount Diablo Astronomical Society Event Calendar–August 2012

| Sunday | Monday                     | Tuesday                             | Wednesday                     | Thursday  | Friday  | Saturday                            |
|--------|----------------------------|-------------------------------------|-------------------------------|---|---|-------------------------------------|
| 29     | 30                         | 31                                  | 7:30 PM California Dreaming 1 | 2   | 3   | Observatory Maintenance (Private) 4 |
|        |                            |                                     |                               |  |   | Sunset: 8:15 PM                     |
| 5      | 6                          | 7                                   | 8                             | 9   | 10  | 7:00 PM Public Astronomy 11         |
|        |                            |                                     |                               |  |   | Sunset: 8:07 PM                     |
| 12     | Board Meeting (Private) 13 | MDAS Imaging SIG (Private) 14       | 15                            | 16  | 17  | Society Observing (Private) 18      |
|        |                            |                                     |                               |   |    | Sunset: 7:59 PM                     |
| 19     | 20                         | 21                                  | 22                            | 23  | 24  | 25                                  |
|        |                            |                                     |                               |   |  | Sunset: 7:49 PM                     |
| 26     | 27                         | 7:15 PM GenMtg: Planet Formation 28 | 29                            | 30  | 31  | 1                                   |
|        |                            |                                     |                               |   |  |                                     |



### Board Members & Address

#### *President*

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#### *Vice President*

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#### *New Member Steward*

Nick Tsakoyias - claytonjandl@aol.com

#### *Mailing address:*

MDAS

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#### *General Meetings:*

Fourth Tuesday every month,  
except on the third Tuesday in  
November and December.

Refreshments and conversations

Meetings begin at 7:15pm.

#### *Where:*

Concord Police Association

5060 Avila Road, Concord, CA 94596-3754

#### *Directions to facility:*

Avila Road is off Willow Pass Road. Turn east  
onto Avila Road approximately 300 yards  
south of the Willow Pass Road off-ramp from  
the Route 4 freeway. Turn right into the Police  
Association Facility at the crest of the first hill.

